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Job Skills and the Service Economy

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Foreword

This paper was commissioned as part of a major project examining the impact of the growth of the service economy on employment. A Council Statement, *Good Jobs, Bad Jobs*, was published in February of this year and a detailed research report will be released later in 1990. The material in this paper, "Job Skills and the Service Economy," represents important technical background to the Council's analysis of the skill effects of a changing labour market, particularly the shifts in the industrial structure.

Much of the debate surrounding the growth in services involves the quality of the new jobs being created, and skills represent an important indicator of job quality. Yet, despite the importance of understanding trends in the skill content of jobs, this has not been an issue well understood by economists, either in academia or in government. In many respects, more useful insights have emerged from the sociological literature. This paper by two sociologists is an attempt to bring an innovative approach to the study of skills.

A great deal of concern has been expressed about the perceived expansion of low-skill jobs resulting from the growth of services. Using a unique self-report dataset, this paper demonstrates that the service sector in fact has a polarized skill distribution, with some industries (e.g., financial services) characterized by high-skill jobs and others (e.g., personal services) by low-skill jobs. Another important finding is that past analyses based on traditional skill measures derived from broad, largely unchanging occupational titles may have overestimated skills in some service industries and underestimated them in the goods sector.

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Judith Maxwell
Chairman

Abstract

The growth of the service economy has generated considerable concern over and divergent views about the job skills required in post-industrial labour markets. Based on a national labour market survey conducted in the early eighties, we examine differences in both job complexity and job autonomy using respondent evaluations of the skill requirements of their jobs across six broad industry sectors. We also compare these results to estimates of skill requirements based on the worker trait scores from the *Canadian Classification and Dictionary of Occupations* (CCDO). The latter measures, based on evaluations made by job assessors in the late sixties, have been used extensively in recent studies of job skills. In broad terms, both the worker trait estimates and the skill requirements reported by the survey respondents paint a similar picture of sectoral differences in the distribution of jobs skills. Jobs in business services (the "information" sector) and in public services (public administration, health education, and welfare) generally require high levels of training and skill. Jobs in retail trade and personal services have low skill requirements relative to jobs in goods production (the "industrial sector"). Distributive services (transport, communication, utilities, wholesale trade) have intermediate skill requirements.

The comparison between respondent reports on job skills and estimates based on the worker trait scores also highlight important differences, however. We show that the construction of the worker trait scores conceal important sex differences in access to job training and the way skills are acquired. Moreover, workers in the goods sector of the economy (manufacturing, construction, etc.) report higher relative skill levels than are indicated by the worker trait estimates. This finding has potentially important implications for future assessments of the impact of employment growth in the service economy on the skill content of the Canadian labour market. It may be that previous studies have exaggerated the "upgrading" in job skills produced by the growth of the service industries or, alternatively, that the improvement in skill levels to be had from such growth is now exhausted.

INTRODUCTION

In this paper, we analyse industry sector differences in the distribution of job skills with data from the Canadian Class Structure Survey (CCSS) conducted on a national sample of the labour force in the winter of 1982-83. The survey is unique by virtue of the number of questions that asked respondents to evaluate the skill content of their jobs. The context of this analysis is a more general interest in the implications of Canada's changing industrial mix for the skill requirements of the Canadian economy. Canada has led the way in the shift away from an economy in which most labour is engaged in the production of goods to one where most labour is now engaged in the production of services (Singelmann, 1978).

The shift of employment from goods to services has been associated with two very different images of the skill requirements of a "post-industrial" labour market. On the one hand, there are the optimistic views associated with Bell (1973) and others who emphasize the knowledge-intensive character of work in a post-industrial economy. On the other, there are the more pessimistic accounts (Braverman, 1974; Kuttner, 1983) pointing to the rapid growth in the low-wage, low-skill personal service industries.

Studies based on a ranking of census occupations according to skill level indicate both views contain a germ of truth. In these studies, the "worker trait" scores from the Canadian Classification and Dictionary of Occupations or CCDO (Canada, 1971) are used to rank census occupational titles along a variety of skill dimensions.[1] They indicate that the service sector has a bifurcated skill distribution (Myles, 1988). Business services (the "information" economy), social services (health, education, and welfare) and public administration have relatively high skill requirements; consumer services, including personal services and retail trade, have very few skilled jobs.

On balance, however, the shift to employment in services appears to have led to a general upgrading of the skill requirements for the economy as a whole (Hunter, 1988; Myles, 1988), for two reasons. First, job growth in the high-skill service sectors has been greater than in low-skill personal services and retail trade. Secondly, jobs in the "industrial" sector of the economy tend to be at the low end of the skill distribution (using worker trait scores), so that the decline

of employment in the goods sector does not result in any measurable loss of skilled jobs in the economy as a whole.

Our purpose in this paper is to establish whether these general conclusions concerning industry differences in skill requirements based on estimates from the worker trait scores are corroborated by the subjective reports of the workers who hold these jobs. Continued use of "worker trait" scores to evaluate the skill content of the labour market has been a matter of concern for several reasons:

Rater bias: There is evidence from American studies of rater bias against female-stereotyped jobs and jobs with low social status (Cain and Treiman, 1981).

Time: Occupations were rated in the 1960s. With the passage of time they become increasingly insensitive to changes that may have occurred *within* occupations.

Occupations and Jobs: The worker trait scores provide *average* skill requirements for broad occupational categories, not jobs. This problem is compounded by the usual requirement to further average within the approximately 486 four-digit SOC categories, since data quality makes coding to the seven-digit level available from the CCDO difficult if not impossible. Because of unequal variances within occupational titles, averages may be misleading.

Conceptions of Skill: In the worker trait approach, skill is largely defined in terms of "job complexity." In many of the discussions of deskilling (e.g., Braverman), the main concern is with skill conceptualized in terms of the autonomy and control that workers have in their work roles.

Using the CCSS respondents' evaluations of the skill requirements of their jobs is helpful in several ways: 1) respondents report on jobs (their own) not occupations; 2) the self-reports are assessments made in the early 1980s and hence reflect changes that may have occurred since the 1960s, when the worker trait estimates were made; and 3) although we are substituting respondent bias for rater bias, we can identify points of disagreement and the possible need for further research.

The comparison is not a validity test in any strict sense of the term because of the very different measurement procedures (self-

reports versus "objective" ratings by job assessors) and the measures used. Instead, our purpose is to determine whether or not descriptions of industry sector differences in skill content derived from application of the worker trait scores to Census occupational titles are corroborated by the subjective reports of the incumbents of those jobs. In short, we are asking workers to provide us with the view from the "shop floor" and to confirm or deny the "best guess" we now have available of the skill requirements of their jobs, based on the worker trait scores assigned to occupations.

Nor do we restrict our attention only to those dimensions of work measurable by the worker trait scores. Part of our objective is to learn about sectoral differences in skill requirements that may be overlooked or that are concealed by the worker trait measures. Recent debates over "deskilling" and "upgrading" have sensitized the social science community to just how vague traditional concepts of "skill" have been. We follow Spenner (1983) who concludes that the concept of "skill" has been used in the literature to direct attention to two separate, though often related, aspects of work roles. The first, *job complexity*, is defined by Spenner (1983:829) as the level, scope, and integration of mental, interpersonal, and manipulative tasks in a job. The second, skill as *autonomy-control*, highlights the notion that "the structure of work roles provides more or less room for the worker to initiate and conclude action, to control the content, manner and speed with which a task is done." The worker trait scores focus almost exclusively on skill defined in terms of job complexity, and that will also be the main focus of our attention here. But the CCSS also included a set of questions on autonomy-control, giving us the opportunity to determine whether this second, very important dimension of work roles follows the same pattern of differences across industry sectors as job complexity.

HIGHLIGHTS

1 Both the self-report and worker trait estimates of sectoral differences in *job complexity* confirm that the service economy is characterized by a polarized distribution of skill requirements. The information sector and the public sector have high skill requirements; retail and personal services have low skill requirements. Distributive services are an intermediate sector with skill requirements slightly higher than those found in goods production.

2 Both sources also confirm that gender differences in skill requirements are most pronounced in the information sector. For males, the information sector has the highest percentage of skilled jobs; for females, the skill requirements in the information sector are similar to those in distributive services.

3 Age differences in skill requirements within industrial sectors are surprisingly modest: young workers in both low-skill and high-skill sectors have skill profiles similar to older workers -- with the exception of retail services.

4 Because of low skill requirements and a youthful but well-educated labour force, retail sales (for females) and personal service (for males and females) stand out as sectors with a large number of overqualified employees, as measured by the match between actual educational attainments and formal educational requirements.

5 The way in which men and women can acquire job skills differs dramatically. Women are virtually excluded from high-skill jobs in which job-relevant skills are provided through on-the-job training. Instead, they are limited to jobs where skills are acquired outside of the workplace -- i.e., in the formal educational system.

6 Sectoral differences in *conceptual autonomy* (the requirement to conceptualize or design important aspects of a product or service) differ slightly in degree and pattern from sectoral differences in job complexity. Information and public services have a high proportion of jobs with conceptual autonomy as well as complexity. But in contrast with the situation with respect to job complexity, the goods sector and the distributive, retail, and personal services have lower requirements for conceptual autonomy and are indistinguishable from each other.

7 Sectoral differences in *task autonomy* (control over working hours and pace of work) are non-existent.

Despite broad similarities in the conclusions to be drawn about sectoral differences in skill requirements from the self-report and worker trait estimates, there are important differences as well.

8 The self-report measures indicate a higher skill mix in the goods

sector relative to other industries than do the worker trait estimates.

9 Whereas the worker trait estimates lead to the conclusion that the retail-sales sector has higher skill requirements than the goods sector, the self-report estimates lead to the opposite conclusion.

In the conclusion, we discuss some of the implications of these differences.

MEASURING JOB SKILLS

The worker trait data include measures of 41 different job characteristics. We have selected two of these for analysis here plus two factor estimates from Hunter and Manley's (1986) analysis of the full set of scores. The two measures taken directly from the CCDO are the scales of General Educational Development (GED) and Specific Vocational Preparation (SVP). As the titles suggest, the former refers to requirements of general reasoning, mathematical, and language skills acquired in schools or otherwise, and the latter to job-specific training requirements. The values and definitions for these measures are presented in Appendix A. The factor scores are Hunter and Manley's (1986) estimates of "cognitive complexity" (the extent to which jobs require verbal, quantitative, and related skills) and "routine activity" (the degree to which a job involves a small number of tasks performed repeatedly). For the purpose of tabular analysis in the case of the latter two measures, the 486 SOC occupational titles were ordered from the lowest to the highest value on the factor scores and then divided into "quintiles" -- i.e., five categories with an equal number of occupational titles in each. A particular occupation would then be assigned a number between 1 and 5 according to the skill class in which it was now contained.

The CCSS contained an extensive battery of items asking respondents to report on both the job complexity and the autonomy dimensions of their work. For purposes of this analysis, we emphasize those items that most closely approximate measures of job complexity and training requirements in the worker trait data as well as two dimensions of autonomy: conceptual and task autonomy. These items will be described as they are introduced in the analysis.

THE SURVEY DATA

The Canadian Class Structure Survey was conducted as a multi-stage probability sample in Canada's ten provinces in the winter of 1982-83 (see Black and Myles, 1986, for more detail). For purposes of this analysis, we rely on a subsample of about 2,000 respondents that approximates Statistics Canada's definition of the experienced labour force - i.e., it includes all those who are currently employed plus all those employed during the past year. There are three reasons for selecting this universe. First, it corresponds to the universe in a previous study of the worker trait scores using Census data (Myles, 1988) and so enables us to check the survey results against those of the Census. Secondly, in the winter of 1982-83 when the survey was conducted, Canada was experiencing the worst recession since the 1930s and unemployment was unusually high. The "experienced labour force" definition of the universe has the advantage of taking account of this fact and limiting the influence of unusually high rates of unemployment on our findings. Finally, using the experienced labour force definition enables us to draw on a larger sample than would be the case if we restricted our attention to those currently employed.

In Table 1 we compare the survey estimates of the distribution of the worker trait scores with estimates based on the 1981 Census of Canada (Myles, 1988). The remarkable similarity between the two sets of estimates is extremely encouraging with respect to the representativeness of the survey results, particularly with respect to the underlying occupational distributions on which the estimates are based.

In the presentation of the results, the agricultural sector is included only in tables where we describe the entire labour force and excluded in tables where skill distributions are presented by age or sex. This is because most farmers are older males and sample size does not enable us to include this sector in the more detailed analyses. Agriculture is also excluded when we consider the autonomy-control dimension of skill. The relevant questions were not asked of the self-employed, a category that includes the majority of farmers. The self-employed were excluded (perhaps incorrectly) on the assumption that they have a high level of autonomy-control in their work roles.

Table 1

Comparison of Estimates of Percentage Distribution of Worker Trait Scores[1] Using the 1981 Census of Canada and the 1982-83 Canadian Class Structure Survey, Experience Non-Agricultural Labour Force

	Level					
General educational development (GED)	1	2	3	4	5-6	Total
	(Per cent)					
Census	6.1	21.3	40.9	20.1	11.5	100.0
Survey	4.9	20.7	40.2	21.3	12.8	100.0

	Level						
Specific vocational preparation (SVP)	<30 days	1-3 months	3-6 months	6-12 months	1-2 years	>2 years	Total
	(Per cent)						
Census	12.0	17.2	17.8	18.9	11.1	23.1	100.0
Survey	11.1	16.8	15.2	19.1	14.1	23.8	100.0

	Level					
Cognitive complexity (CC)	1	2	3	4	5	Total
	(Per cent)					
Census	16.9	13.7	28.9	19.5	21.0	100.0
Survey	14.6	13.0	27.0	20.9	24.5	100.0

	Level					
Routine activity	1	2	3	4	5	Total
	(Per cent)					
Census	17.4	19.2	28.4	17.8	17.2	100.0
Survey	17.3	16.7	27.1	22.7	16.2	100.0

1 Skill measures are ordered from lowest (1) to highest (5).

Source Class Structure Survey and Census of Canada.

SECTORAL DIFFERENCES IN JOB SKILLS: THE VIEW FROM THE "SHOP FLOOR"

We begin by examining sectoral differences in skill requirements based on the self-reports of the survey respondents. In contrast to the worker trait estimates based on expert evaluations, self-reported

skill requirements provide an evaluation of jobs from the perspective of those actually doing the work – the view from the "shop floor". Our emphasis is on skill differences by industrial sector, based on a seven-sector classification scheme defined in Appendix B.

1 Agriculture.

2 The "goods" sector of the economy includes all manufacturing and construction industries as well as the extractive (or primary) sector industries except agriculture. These industries broadly correspond to what is conventionally thought of as the core of an "industrial" economy.

3 Distributive services include transportation, communications, utilities and wholesale trade. Though part of the service sector, it is useful to recognize that *historically* these industries developed alongside industrial production in manufacturing. Indeed, the railways are often thought of as synonymous with the "industrial revolution."

4 Retail services and 5) Personal services incorporate what are generally thought to be the low-skill sector of the service economy, including retail trade and the "servant" industries such as food, accommodation, and cleaning services.

6 Information services include business services and the financial, insurance, and real estate industries. It is useful to recognize that many of the services provided in this sector are, in fact, services in support of goods production that were once performed within manufacturing enterprises and depend on manufacturing for their survival and growth.

7 Public services include public administration (federal, provincial, and local government) and what might be broadly designated as the "welfare state" industries (health, education, and welfare).

Job Complexity

In the CCSS, respondents were asked to evaluate their jobs on two sets of indicators related to job complexity. The first set, which we call Abstract Problem Solving, includes indicators of the intel-

lectual or mental complexity of the job.[2] The second set consists of indirect measures of job complexity, which measure the training requirements for entry into a job.

Abstract Problem Solving

Our indicators of abstract problem solving -- the extent to which the respondent is required to apply abstract and general principles to solve concrete problems -- include responses to two questions.

1 Thought and Attention (CCSS Q70): Respondents were asked:

> "We would like to know about the kinds of problems which normally arise in your job, and the amount of thought and attention you need to deal with them. I am going to show you some statements and ask you to pick the one which *best* describes the thought and attention your job normally demands of you."

Little Thought and Attention (My work is usually Routine and Problems Seldom Arise)

Some Thought and Attention (Problems which Arise Normally Require Straightforward Solutions)

Simple Problem Solving (Unforseen Problems Arise which Require Some Practical Experience)

Difficult Problem Solving (Difficult Problems Arise which Require Considerable Experience and Careful Analysis to Solve)

Complex Problem Solving (Highly Complex Problems Arise which Require a High Level of Abstract Knowledge and Theory to Solve).

2 Abstraction (CCSS Q68F): Respondents were asked:

> "Could you tell me how much your job requires abstract knowledge about the ideas behind your work such as the application of general principles or theories to solve a problem?"

Five response categories (NONE to a GREAT DEAL) were available.

Based on the marginal distributions, each five-category response set was reduced to three skill levels: low, medium, and high.[3] An important difference between the two types of indicators is that Thought and Attention (Q70) defines the response set, while Abstraction (Q68f) leaves it up to the respondent to decide what is meant by "none" or a "great deal" of abstract knowledge. Because of this difference, we presume greater intersubject reliability on the former measure and put more emphasis on this indicator in our analysis.

The distributions by industry sector as well as by a five- occupation classification are presented in Tables 2 and 3. On both measures, information and public services, as well as agriculture, are the industries with the highest skill level, while personal services have the lowest skill content. Distributive services fall in an intermediate category. The goods sector ranks higher than retail services on "Thought and Attention" but is similar to retail services on "Abstract Knowledge." The occupational patterns add few new insights. Managers, as well as professional and technical workers, report high levels of job complexity, followed by workers in goods production, and clerical and sales workers. Service workers have the lowest levels of job complexity.

The general ranking of industrial sectors by job complexity is illustrated graphically in Chart 1; the pattern is one that will be repeated frequently in our results. The shift from goods to services provides a mixed picture of the resulting skill profile of the work force, since the service economy is composed of a set of high-skill industries (information and public services) and a set of low-skill industries (retail and personal services). Between these two extremes, distributive services (which historically developed alongside industrial manufacturing) provide jobs similar to or slightly higher in skill content than the goods-producing sector.

Chart 2 and Table C-1 (Appendix C), however, show that this characterization is not the same for men and women. In all industries, fewer women report holding skilled jobs; however, the gender gap is accentuated in the high-skill information services and,

Table 2

Two Measures of Job Complexity by Industry, Self-Reports

	Thought and attention				Abstract knowledge			
	Low	Medium	High	Total	Low	Medium	High	Total
	(Per cent)							
Agriculture	17	26	57	100	23	23	54	100
Goods	28	36	36	100	33	24	43	100
Distributive services	25	30	45	100	32	20	48	100
Retail	30	41	29	100	34	24	42	100
Personal services	44	30	26	100	49	16	34	100
Information services	14	32	54	100	18	24	58	100
Public services	17	26	57	100	17	17	66	100

Source Class Structure Survey.

Table 3

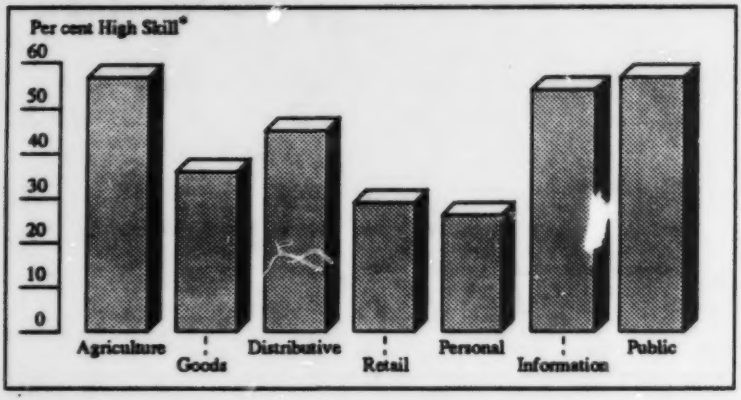
Job Complexity by Occupation, Self-Reports

	Thought and attention				Abstract knowledge			
	Low	Medium	High	Total	Low	Medium	High	Total
	(Per cent)							
Managerial	6	13	81	100	4	16	80	100
Professional and technical	8	23	69	100	7	17	76	100
Clerical and sales	26	43	31	100	34	25	41	100
Services	46	31	23	100	51	16	33	100
Goods	29	32	38	100	34	23	44	100

Source Class Structure Survey.

Chart 1

Job Complexity by Industry

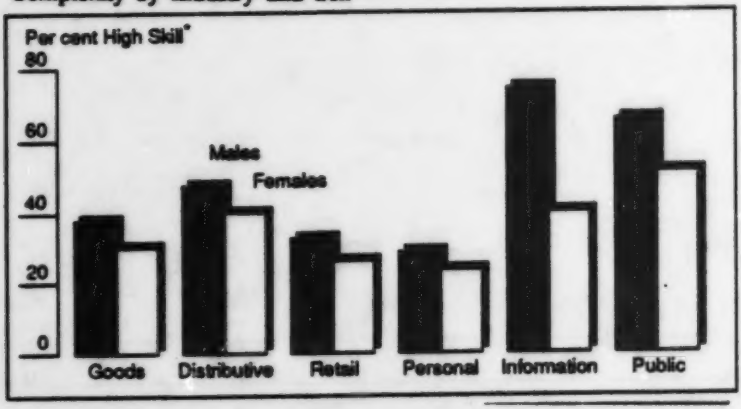


* High Skill = Per cent High (Levels 4-5) on CCS Q70, Thought and Attention.

Source Class Structure Survey.

Chart 2

Complexity by Industry and Sex



* High Skill = Per cent High (Levels 4-5) on CCSS Q70, Thought and Attention.

Source Class Structure Survey.

to a lesser degree, in the public service industries. Gender differences are especially pronounced in the information services, which for women are similar to distributive services in skill requirements. For men, in contrast, information services contains the highest percentage of skilled jobs.

Chart 3 and Table C-2 (Appendix C) show that the skill gradient by age within industrial sectors is surprisingly modest. Indeed, in view of the constraints on sample size when three age groups are cross-classified by six industry sectors, the absence of more random fluctuation in those patterns is quite remarkable. The main exception is the lower skill levels among young people in retail sales. This finding, however, underlines the difficulty in interpreting age differences in a cross-sectional design. Will the young people in retail sales move up to the skill levels of the older cohorts as they age? Or does the age difference in skill level represent declining skill requirements in retail sales? There is no way to answer these questions with cross-sectional data.

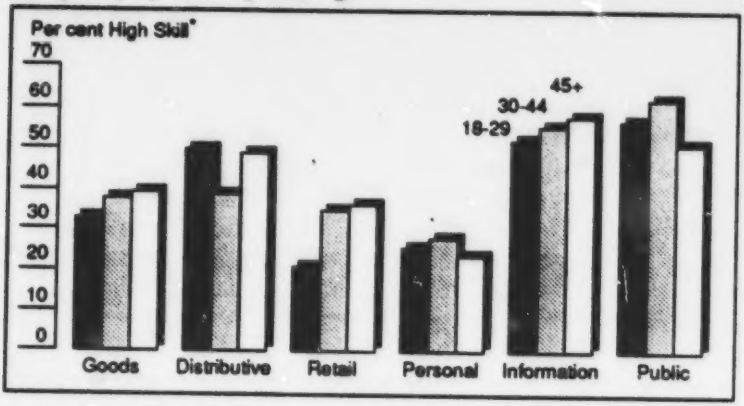
Training Requirements

The training requirements for jobs is an ambiguous indicator of the actual skill content of work, especially where the training required is in the form of acquiring formal educational credentials. Educational requirements may be an indicator of the skill requirements of work; they may also indicate the success or failure of different occupational groups in creating barriers to entry in order to restrict supply and increase the price of their services. It is less likely, however, that employers will provide extensive on-the-job training for this reason.

Formal Education -- CCSS respondents were asked about the formal education and on-the-job training *now normally required* of people who do the kind of work performed by the respondent, as well as about their own educational attainments. Table 4 shows the distribution of actual educational *attainments* and Table 5 shows current educational *requirements* by industry sector. The rank ordering of sectors differ slightly from that noted with respect to job complexity. There are very high attainments and requirements in information and public services (especially the latter). Actual educational attainments in goods, distributive services, retail trade, and personal services do not differ greatly, a result that matches the

Chart 3

Complexity by Industry and Age



* Per cent High Skill = Levels 4-5 on CCSS Q70, Thought and Attention.

Source Class Structure Survey.

Table 4

Educational Attainment by Industry

	Less than high school diploma	Completed high school	College/ vocational	University degree	Total
			(Per cent)		
Agriculture	52	30	13	6	100
Goods	42	37	14	8	100
Distributive services	34	45	18	4	100
Retail	38	41	19	3	100
Personal services	43	34	17	6	100
Information services	12	48	12	28	100
Public services	16	24	16	45	100
Total	32	35	15	18	100

Source Class Structure Survey.

Table 5

Educational Requirements by Industry, Self-Reports

	Less than high school diploma	Completed high school	College/ vocational	University degree	Total
			(Per cent)		
Agriculture	43	33	22	2	100
Goods	48	27	16	9	100
Distributive services	33	38	20	9	100
Retail	47	35	16	2	100
Personal services	17	18	23	42	100
Information services	11	18	23	42	100
Public services	17	18	23	42	100
Total	36	27	19	18	100

Source Class Structure Survey.

clustering resulting from the abstract-knowledge measure of job complexity. But that is not the case with respect to current requirements for entry, which more closely resemble the thought-attention measure of job complexity. On this, distributive services (29 per cent require some postsecondary education) and goods (where 25 per cent require postsecondary education) cluster together and have higher requirements than retail and personal services, where the corresponding figures are 18 and 13 per cent, respectively.

The Great Training Robbery? -- These data also enable us to address the concern over the extent to which the expansion of low-skill work in a society with increasingly high levels of educational attainments is creating a mismatch between people and jobs. The concern, first raised by Ivar Berg's *The Great Training Robbery* (1970), is that such a situation will lead to dashed expectations and boredom on the job, which will in turn have a depressive effect on worker productivity.

To measure the match between actual attainments and current requirements, each respondent was coded on a scale indicating

whether he or she was highly overqualified, slightly overqualified, qualified, slightly underqualified, or considerably underqualified. Over- and under-qualification were measured by gaps in the four educational levels reported in Tables 4 and 5. A difference of one level was coded as slightly over- or underqualified. A gap of two levels was coded as highly over- or underqualified. For example, someone reporting that his/her current position requires a high school diploma but that he/she has completed a college/vocational programme is slightly overqualified and highly overqualified if he/she has a university degree.

Table 6 shows the pattern of overqualification by industry sector. In view of the results in Tables 4 and 5, one could anticipate that personal services will be the sector with the greatest mismatch; this turns out to be the case. In all sectors, between 15 and 23 per cent of workers are slightly overqualified; the percentage of highly overqualified workers ranges between 6 and 11 per cent. The exception is in personal services, where the percentage of highly overqualified workers rises to 22 per cent.

The results in Table 7 show that there are important interactions with sex. In retail sales, the match for males approximates that found in other industries, while for females the overqualified proportion rises to 41 per cent. On the other hand, it is in personal services where men may be singled out for being overqualified (50 per cent). In sum, overqualified males are concentrated in the personal-service sector, while overqualified females are found in both personal services and retail trade. The results for retail services are especially interesting in view of the fact that, while men in retail trade are slightly more likely to have a postsecondary education (24 per cent) than women (20 per cent), men are twice as likely (23 versus 12 per cent) to be in a position that *requires* postsecondary qualifications.

The difficulty in interpreting these results is brought home in Table 8, which controls for age. It is clear that the exceptional character of the personal-service sector is a feature of the youth labour market rather than of the labour market in general. But exactly what long-term implication we should draw from this is by no means clear. It could mean that: 1) the personal-service sector is a temporary entry point for youth and that further sorting by credentials will occur as they age; or that 2) the growth of the personal-service sector has changed the structure of the labour

Table 6

Match Between Educational Requirements and Attainment[1] by Industry, Self-Reports

	Slightly over-qualified	Highly over-qualified	Total over-qualified
		(Per cent)	
Agriculture	21	8	29
Goods	22	11	33
Distributive services	23	6	29
Retail	23	11	34
Personal services	23	22	45
Information services	15	7	22
Public services	20	6	26
Total	21	9	30

1 In comparing attainment to requirement, one level different implies slightly overqualified, two imply highly overqualified.

Source Class Structure Survey.

Table 7

Match Between Educational Requirements and Attainments by Sex and Industry

	Overqualified[1]	
	Males	Females
	(Per cent)	
Goods	33	34
Distributive services	30	26
Retail	26	41
Personal services	50	41
Information services	20	23
Public services	20	29
Total	29	32

1 Proportion of males and females whose educational attainment exceeds the requirement of the job they occupy.

Source Class Structure Survey.

Table 8

Match Between Educational Requirements and Attainment[1] by Age and Industry[2]

	Age			
	18 - 29 years		30 + years	
	Slightly overqualified	Highly overqualified	Slightly overqualified	Highly overqualified
	(Per cent)			
Goods	26	15	21	9
Distributive services	28	4	21	7
Retail	31	7	19	14
Personal services	24	29	19	11
Information services	27	6	5	7
Public services	26	4	18	6

1 In comparing attainment to requirement, one level different implies slightly overqualified, two imply highly overqualified.
2 Excluding agriculture.

Source Class Structure Survey.

market so that at least this cohort - and possibly future cohorts that will have even higher levels of education -- are permanently locked in to a labour market with a poorer match between credentials and job requirements.

To determine whether one, or perhaps both, of these interpretations is correct, longitudinal data are required.

On-the-Job Training -- When we turn to training required on the job (Table 9), the pattern observed so far changes significantly. The personal-service sector continues to be the lowest ranked: only 15 per cent of positions require more than a year of training. In contrast, it is apparent that agricultural work is training-intensive -- 54 per cent report that a year or more of training is required, and most of these (41 per cent) report that over two years of training is required.

Table 9

On-the-Job Training Requirements by Industry, Self-Reports

	Short demonstration	Up to 30 days	1-3 months	3-12 months	1-2 years	More than 2 years	Total
				(Per cent)			
Agriculture	18	5	6	17	13	41	100
Goods	21	17	15	16	6	25	100
Distributive services	21	19	10	19	9	22	100
Retail	25	25	18	11	9	12	100
Personal services	45	10	13	17	8	7	100
Information services	19	13	20	22	10	17	100
Public services	27	14	14	20	11	14	100
Total	25	15	14	18	9	19	100

Source Class Structure Survey.

But more interesting is the fact that the goods sector and distributive services also require more extensive on-the-job training than most other sectors, *including* information and public services, which rank with retail services.

There are clearly "substitution effects" across industries, with some sectors (notably information and public services) relying more heavily on the formal educational system to train employees, while other sectors provide workers with training in the workplace. There is an obvious historical element in this pattern, with the "modern" sectors of the economy (information and public services) relying more on the educational system.

The most dramatic differences emerge when we examine on-the-job training, by gender. The distributions in Table 10 show that women are virtually excluded from jobs that require extensive on-the-job training. In the whole economy, 29 per cent of men report that they are in jobs requiring two or more years of training, compared with 6 per cent of women. And the magnitude of this gender gap is similar across all sectors. This pattern is even more remarkable when we consider that there is little difference in the level of educational attainments between men and women within industrial sectors (Table 11). In fact, within the labour force as a

Table 10

On-the-Job Training by Sex and Industry[1], Self-Reports

	Short demonstration	Up to 30 days	1-3 months	3-12 months	1-2 years	More than 2 years	Total
				(Per cent)			
Goods[1]							
Male	19	16	13	17	5	30	100
Female	29	20	24	10	7	10	100
Distributive services							
Male	23	18	8	19	4	28	100
Female	16	21	17	20	19	7	100
Retail							
Male	16	17	25	6	13	23	100
Female	34	32	13	14	6	1	100
Personal services							
Male	30	5	17	21	11	16	100
Female	55	14	10	14	7	0	100
Information services							
Male	18	12	12	23	5	31	100
Female	19	13	26	21	13	7	100
Public services							
Male	22	10	7	27	12	22	100
Female	30	17	19	15	11	9	100
Total							
Male	20	13	11	19	8	29	100
Female	31	19	18	15	10	7	100

1 Excluding agriculture.

Source Class Structure Survey.

Table 11

Educational Attainments by Sex and Industry Sector, Self-Reports

	Less than high school	Completed high school	College or vocational	University degree	Total
			(Per cent)		
Goods					
Male	41	38	14	7	100
Female	43	36	13	8	100
Distributive services					
Male	38	43	15	4	100
Female	24	49	23	4	100
Retail					
Male	46	30	23	1	100
Female	30	49	16	5	100
Personal services					
Male	41	38	13	9	100
Female	45	31	21	3	100
Information services					
Male	14	40	11	34	100
Female	10	54	13	23	100
Public services					
Male	16	23	12	49	100
Female	16	24	18	42	100
Total					
Male	35	35	14	16	100
Female	26	36	17	21	100

Source Class Structure Survey.

whole women have slightly higher attainments: 21 per cent of women have a university degree compared to 16 per cent of men. And women are also slightly more likely to be in jobs that *require* formal educational credentials (Table 12).

The implications of this pattern are quite significant for our understanding of the gender organization of the labour market. Women gain access to skilled jobs for which training costs are absorbed by the job incumbent and/or by the public (i.e., in the formal educational system). But women are excluded from jobs in which training costs are absorbed by employers (on-the-job training). The pattern is so striking because the differences between men and women are not just a matter of *degree*: in all sectors, women are virtually *excluded* from jobs requiring extensive on-the-job training.

It is instructive to reflect on these results in light of Thurow's (1975) discussion of earnings differences produced in labour markets based on wage competition and those based on job competition. In the former, workers bid on jobs and employers hire the lowest bidder with the highest potential marginal productivity as measured by his/her education, experience, and other forms of "human capital." In the latter, skills do not reside in the worker but in the job. Skills are acquired on-the-job and employers use attributes such as education, age, and sex as indicators of the workers' "trainability" and of potential training costs. Educational achievements matter because they are an indicator of the "ability to learn." Our findings indicate that, despite high levels of educational achievement, women are virtually excluded from labour markets based on job competition. As a result, they must compete in labour markets based on wage competition and acquire job relevant skills prior to entry or at least outside of the labour market.

In the following section, we combine information on both educational and on-the-job training to provide a summary index of training requirements that is comparable with the worker trait measure of Specific Vocational Preparation (SVP). Because of the important sectoral differences in the way training is acquired, this is a useful tool for purposes of comparing actual interindustry differences in skill requirements. The way in which this combined index conceals the gender-specific way that workers acquire the relevant training, however, should be kept in mind.

Table 12

Educational Requirements by Sex and Industry, Self-Reports

	Less than high school	Completed high school	College or vocational	University degree	Total
			(Per cent)		
Goods					
Male	49	26	16	9	100
Female	43	31	16	10	100
Distributive services					
Male	38	35	16	11	100
Female	22	46	28	3	100
Retail					
Male	50	27	23	0	100
Female	44	43	9	3	100
Personal services					
Male	68	13	12	7	100
Female	71	20	7	2	100
Information services					
Male	14	24	22	40	100
Female	10	48	24	18	100
Public services					
Male	16	16	15	53	100
Female	19	19	28	34	100
Total					
Male	39	26	17	18	100
Female	31	30	21	18	100

Source Class Structure Survey.

Summary: Sectoral Differences in Job Complexity

To capture sectoral differences in the way in which jobs skills are acquired (in school versus on-the-job), we have modified the "on-the-job training" measure to take account of educational requirements. This combined index is conceptually equivalent to the worker trait measure of Specific Vocational Preparation (SVP) that we examine later in the paper. This "proxy" of the SVP scale is labelled PSVP. The SVP *categories* are identical to our "on-the-job training" categories, but they are constructed to take account of training provided within the educational system. For each occupation, one hour of specific vocational preparation is imputed for every two hours of vocationally oriented postsecondary education. To adjust our measure of "on-the-job training" to this standard, we assigned a year of training to each job requiring a postsecondary degree (including college or vocational training). The correlation between the original "on-the-job training" measure and the SVP index is 0.39. After adjusting for educational requirements (PSVP), the correlation with SVP rises to 0.56. The distributions of PSVP by industry sector are shown in Table 13 and illustrated in Chart 4, where the percentage scoring high on "Thought and Attention" (Q70) by industry is also included.

On both indicators, a very consistent pattern emerges. Agriculture, information services, and public services are high-skill industries; goods and distributive services are medium-skill industries; and retail and personal services are low-skill industries. In sum, as measured by our indicators of job complexity, the shift from a traditional "industrial economy" based on employment in goods production and distribution to a "post-industrial" labour market has two offsetting results: a growth in high-skill industries related to the provision of public services and information services (the latter consisting mainly of services to business), and low-skill consumer services, including the retail sector.

Autonomy

As Spenner (1983) points out, a second, though related, conception of job skill is skill as *autonomy-control*. The core idea here is not control over the work of others but control over one's own work.[4] It is also possible to distinguish further between autonomy of *conception* (conceptual autonomy) and autonomy of *execution* (task

Table 13

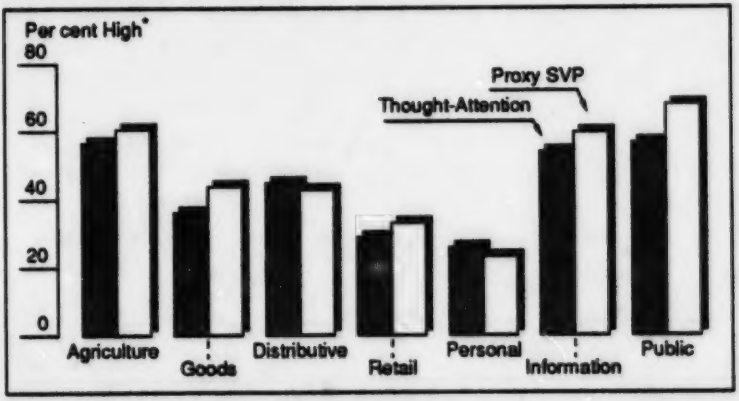
Proxy SVP by Industry

	Short demonstration	Up to 30 days	1-3 months	3-12 months	1-2 years	More than 2 years	Total
				(Per cent)			
Agriculture	17	5	5	12	6	55	100
Goods	19	14	12	11	12	32	100
Distributive services	18	18	9	12	12	31	100
Retail	23	21	15	8	12	21	100
Personal services	44	8	11	13	8	15	100
Information services	13	5	12	10	33	27	100
Public services	12	7	6	7	43	25	100
Total	19	11	10	10	22	28	100

Source Class Structure Survey.

Chart 4

Job Complexity by Industry



* Per cent High: Thought and Attention = Levels 4-5 on Q70; PSVP = Per Cent Requiring Year or More Training.

Source Class Structure Survey.

autonomy). Autonomy of conception refers to the requirement in a job to conceptualize or design important aspects of a product or service; autonomy of execution refers to the conditions under which the task is actually accomplished (i.e., controlling the pace of work, how and when one does one's work, and so on).

Conceptual Autonomy

In the CCSS, measuring autonomy of conception was a matter of some analytical importance for the larger concerns of the project. And the procedure we used to capture this dimension of skill was quite different from the other skill scores we have considered. All respondents were asked:

> "... is yours a job in which you are required to design important aspects of your own work and to put your ideas into practice? Or is yours a job in which you are not required to design important aspects of your own work or to put your ideas into practice, except perhaps in minor details."

Respondents who indicated that they were required to design important aspects of their work were then asked in an open-ended question to provide an example of how they designed their own work and put their ideas into practice. The main purpose of this was to eliminate exaggerated claims to autonomy. The examples were then coded according to a rating scale of high, medium, low, and no autonomy, following a protocol that was initially designed for the American version of the survey and that the two principal investigators of the CCSS were able to replicate with an acceptably high level of reliability. This question *was not asked* of self-employed respondents, since it was assumed that autonomy of this sort was an essential component of self-employment. As a result, agriculture is excluded from this analysis.

The distributions by industry sector are presented in Table 14. The pattern is similar to that for the measures of job complexity; however, the differences between goods and distributive services, on the one hand, and retail and personal services, on the other, are considerably attenuated. Indeed, if we consider those with little or no autonomy (column 1), the four sectors are virtually identical. In contrast, the difference between these four sectors and information

services (23 per cent with high autonomy) and especially public services (43 per cent with high autonomy) is quite dramatic.[5] This appears to match the grouping using the abstract-knowledge measure (Table 2) and educational attainment (Table 4).

Sex differences with respect to autonomy are low in the goods sector (Table 15) but quite marked in all sectors of the service economy. As with job complexity, the differences in the information sector are the most dramatic: only 29 per cent of males have little or no autonomy compared to 61 per cent of females. Again, there is a surprisingly small age gradient in conceptual autonomy in all sectors (Table 16) except possibly for retail trade. The high autonomy-share figures in information and public services underline the importance for young people of entry into either the information (for males) or public sectors in order to find opportunities for creative work.

Task Autonomy

To measure "task autonomy," respondents were asked:

> "Here are a number of different work activities. For each one please tell me if you can do this on your job either officially or unofficially.
>
> -- Decide on your own how to go about doing your work? (How To Do Job)
>
> -- Decide on your own to introduce a new task or work assignment that you will do on your job? (Introduce New Task).
>
> -- Considerably slow down your pace of work for a day when you want to? (Control Work Pace)
>
> -- Take a day off from work without losing pay or having to claim vacation time, sick leave or put in compensatory time. (Take Time Off)
>
> -- Decide when to come to work and when to leave work? (Control Working Hours).

Each question could be answered only with a simple "Yes" or "No".

Table 14

Conceptual Autonomy by Industry, Self-Reports

	Conceptual autonomy			
	Low or none	Medium	High	Total
	(Per cent)			
Goods	70	18	12	100
Distributive services	68	22	10	100
Retail	69	26	5	100
Personal services	74	19	7	100
Information services	49	27	23	100
Public services	44	13	43	100

Source Class Structure Survey.

Table 15

Conceptual Autonomy by Industry and Sex, Self-Reports

	Conceptual autonomy			
	Low or none	Medium	High	Total
	(Per cent)			
Goods				
Male	68	19	13	100
Female	78	11	11	100
Distributive services				
Male	63	25	12	100
Female	81	15	4	100
Retail				
Male	58	33	9	100
Female	77	21	2	100
Personal services				
Male	67	19	14	100
Female	79	19	2	100
Information services				
Male	29	35	36	100
Female	61	23	16	100
Public services				
Male	32	15	53	100
Female	52	12	36	100

Source Class Structure Survey.

Table 16

Conceptual Autonomy by Industry and Age

	Conceptual autonomy			
	Low or none	Medium	High	Total
	(Per cent)			
Goods				
18-29 years	70	25	5	100
30-44 years	70	15	15	100
45+ years	72	11	17	100
Distributive services				
18-29 years	77	15	8	100
30-44 years	63	25	12	100
45+ years	63	28	9	100
Retail				
18-29 years	76	21	3	100
30-44 years	52	37	11	100
45+ years	74	23	3	100
Personal services				
18-29 years	75	18	7	100
30-44 years	69	24	7	100
45+ years	79	15	6	100
Information services				
18-29 years	50	30	20	100
30-44 years	49	23	28	100
45+ years	49	27	24	100
Public services				
18-29 years	47	17	36	100
30-44 years	37	10	53	100
45+ years	51	13	36	100

Source Class Structure Survey.

The distributions in Table 17 show only modest differences across industrial sectors. Information services stand out particularly with respect to the ability of workers to take time off. But on the majority of indicators, public services (a high-skill industry, with high conceptual autonomy) differ little from retail and personal services.

The main source of task autonomy is occupation (Table 18): managers score high on all indicators, and they make up most of those able to take time off and control their own working hours. Service and goods occupations have the least amount of task autonomy and are similar on all indicators. The professional/technical occupations are more likely than clerical and sales occupations to have control over how they do their work and introduce new tasks, but they are similar to the clerical/sales category on other indicators.

COMPARISON WITH WORKER TRAIT DATA

In this section, we compare the sectoral differences in skill composition identified with the respondents' own evaluations of their work situation to those identified with the worker trait scores. One might think of this exercise as contrasting the way workers evaluate their own skill requirements with the "objective" evaluations of the skill requirements of the respondents' occupations provided by the CCDO.

Job Complexity

In order to contrast the results of the self-reported levels of job complexity with the worker trait estimates, Table 19 presents industry distributions for General Educational Development and two of Hunter and Manley's factor scores derived from the worker trait data – Cognitive Complexity and Routine Activity. Scores are ordered from low- to high-skill. It is important to emphasize that we are describing the *same* jobs with two sets of measures. The occupation of each respondent was coded to the four-digit classification used in the 1971 Census. On the basis of this code, we assigned respondents the corresponding skill scores on each of the worker trait items and the Hunter and Manley factor estimates based on these items. The question, then, is whether an analysis based on this alternative method for measuring skills produces conclusions similar to those described above.

Table 17

Task Autonomy by Industry

	Proportion with task autonomy				
	How to do job	Introduce new tasks	Control work pace	Take time off	Control hours
	(Per cent)				
Goods	71	41	45	26	24
Distributive services	68	41	44	31	23
Retail	75	47	45	23	26
Personal services	64	47	43	20	21
Information services	78	55	54	48	37
Public services	78	56	43	25	27

Source Class Structure Survey.

Table 18

Task Autonomy by Occupation, Self-Reports

	Proportion with task autonomy				
	How to do job	Introduce new tasks	Control work pace	Take time off	Control hours
	(Per cent)				
Managerial	97	79	73	63	70
Professional/technical	84	65	48	30	30
Clerical/sales	71	50	47	36	28
Service	67	33	39	18	15
Goods	63	32	36	16	16

Source Class Structure Survey.

Table 19

Job Complexity by Industry Sector, Worker Trait Estimates[1]

	General educational development					Cognitive complexity						Routine activity					
	1-2	3	4	5-6	Total	1	2	3	4	5	Total	1	2	3	4	5	Total
	(Per cent)																
Agriculture	18	82	0	0	100	10	9	1	80	0	100	2	17	1	80	0	100
Goods	43	38	11	8	100	23	21	29	12	15	100	20	24	31	15	10	100
Distributive services	16	58	18	8	100	8	23	33	21	15	100	17	26	27	17	13	100
Retail	31	49	5	15	100	12	3	42	27	16	100	28	13	35	7	16	100
Personal services	51	33	12	4	100	45	7	27	13	8	100	46	8	26	12	8	100
Information services	5	43	38	14	100	0	4	28	30	38	100	5	17	20	38	20	100
Public services	9	33	37	21	100	5	9	16	27	43	100	6	8	23	37	26	100
Total	25	43	20	12	100	14	13	25	25	23	100	16	17	26	26	15	100

1 Scores have been ordered from low to high skill. In the case of routine activity, 1 represents occupations with the greatest amount of routinization (lowest skilled).

Source Class Structure Survey.

The worker trait estimates of sectoral differences in job complexity confirm many of the major conclusions from the analysis of the self-report data:

1 Information and public services are high-skill sectors and have few very low-skill jobs.

2 The personal service sector provides mainly low-skill jobs.

3 Distributive services and the goods sector fall in between the high-skill information and public services, on the one hand, and the low-skill personal-service sector, on the other.

Despite these similarities, there are important differences as well, which are highlighted in Charts 5 and 6. In Chart 5, the proportion with a score of 4 or more on Hunter and Manley's Cognitive Complexity scale is contrasted with the proportion scoring 4 or more on question 70 – "Thought and Attention." Similarly, Chart 6 compares the proportion scoring 4 or more on "Thought and Attention" with the proportion with a score of 4 or more on the worker trait scale of General Educational Development. Two major differences stand out in this comparison:

1 Whereas the self-report data generally lead to the conclusion that the skill mix in retail services is lower than in the goods sector, the worker trait data indicate that a shift from goods to retail services would either lead to upgrading (Chart 5) or to no change in the skill mix (Chart 6).

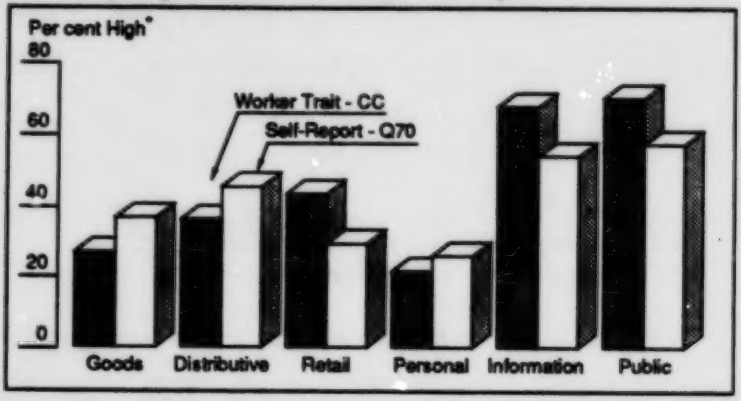
2 The self-report measure indicates a higher skill level in goods and in distributive services *relative* to other industries than do the worker trait estimates.

There is no way of knowing which set of scores is the more accurate reflexion of the true skill distribution by industry. If, however, we were to substitute one for the other, we could anticipate a number of differences:

1 A decline in employment in the goods sector and a rise in employment in retail sales would lead us to the conclusion that there was little change or even some upgrading, using the worker trait estimates. The same change would lead us to conclude that there was deskilling, using the self-report skill scores.

Chart 5

Job Complexity, Worker Trait Versus Self-Report

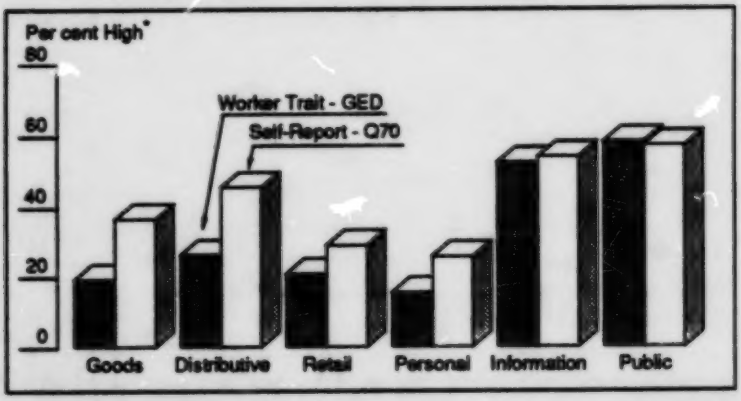


* Per cent High: Worker Trait = 4-5 on Cognitive Complexity; Self-Report = 4-5 on CCSS Q70, Thought and Attention.

Source Class Structure Survey.

Chart 6

Job Complexity, Workers Trait Versus Self-Report



* Per cent High: Worker Trait = GED, 4+; Self-Report = Q70, Thought and Attention, Levels 4-5.

Source Class Structure Survey.

2 The magnitude of upgrading produced by a decline in employment in goods production and growth in information and public services will be substantially greater, using worker trait estimates of the skill distribution as opposed to the self-reported skill levels. That is because the magnitude of the skill difference between the goods sector and the high-skill information and public sectors is much greater in the worker trait distributions.

To illustrate, we estimated the hypothetical change in the skill distribution that would have occurred as a result of changes in industrial composition between 1951 and 1981, using the alternative measures of skill (and assuming a constant skill mix within industrial sectors).[6] This hypothetical "industry effect" raised the proportion of workers with a GED score of 4 or higher by 10 percentage points (from 28 to 38 per cent), and the proportion of those in levels 4 and 5 on Hunter and Manley's measure of Cognitive Complexity by 7 per cent (from 38 to 45 per cent). In contrast, there was only a 2-point change (from 40 to 42 per cent) in the percentage of workers in levels 4 and 5 on "Thought and Attention." In effect, substituting the "self-report" for the "worker trait" estimates of the distribution of skill by sector significantly reduces the upgrading effects of a changing industrial structure. This is mainly because the relative skill level in the goods sector is higher in the self-report estimates than in the worker trait estimates, so that there is less to be gained from a decline in goods production and a shift to services: the cost of the shift to low-skill services is greater, and upgrading from the growth of the high-skill services is lower.

Training Requirements

The most directly comparable measures in the self-report and worker trait scores are the Specific Vocational Preparation Scale (SVP) from the worker trait family of measures and the proxy SVP (PSVP) created with the self-reports on training and educational requirements in the CCSS data. The PSVP categories are identical to those of the SVP. The distributions for SVP and PSVP are plotted in Chart 7.

A first observation concerns the rather different shapes of the distributions of the two measures. The upper end (1-2 years, 2+ years) is similar in both distributions. But for jobs requiring less than a year, the distribution of SVP is skewed toward the high end

while that for PSVP is skewed toward the bottom. Approximately 30 per cent of respondents say their job can be learned with a short demonstration or in less than 30 days, while the corresponding worker trait figure is about 10 per cent. Overall, the self-report data indicate a more polarized skill distribution -- more high-skill and more low-skill jobs -- than the worker trait distribution.

Comparison of the sectoral distributions of SVP and PSVP (Chart 8) tells a story that is similar but not identical to that found in our comparison of worker trait and self-report estimates of job complexity:

1 Whereas there was some reversal of the ordering of sectors by skill level on the measures of job complexity, the rank ordering of sectors on both measures of training time is identical. Information and public services are high-skill industries; goods and distributive services are in the middle and quite similar in skill profile; retail and personal services have the lowest skill mix.

2 As with the job-complexity measures, however, the worker trait estimate of training requirements in goods (and distributive services) is much lower, relative to other sectors, than in the self-report estimates. And, as a result, we would expect the "upgrading" that results from the shift from goods to services to be larger, using worker trait estimates of training requirements, than with self-reports of training time.

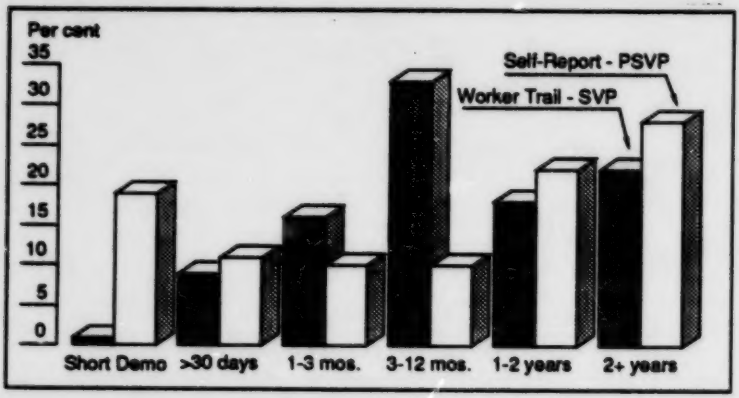
Again, for illustrative purposes, we estimated hypothetical industry-shift effects that would be produced by changes in the Canadian industrial mix between 1951 and 1981, using the SVP and PSVP estimates of the skill distribution. The results are less dramatic but in the same direction as in the analysis of job complexity. The estimated industry-shift effect using SVP was a 5-percentage-point change (from 31 to 36 per cent) in the number requiring a year or more of training, compared with a 3-point change (from 45 to 48 per cent) using PSVP-based estimates.

The difference between the worker trait and self-report results could be explained in several ways:

1) workers in the goods sector are more likely to inflate the skill requirements of their jobs than workers in other sectors;

Chart 7

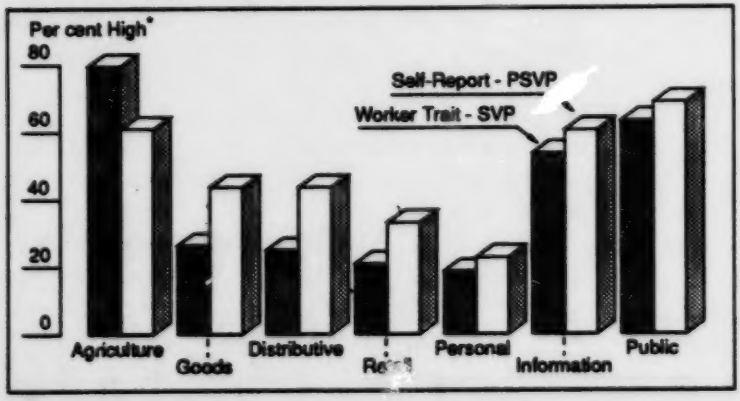
Training Requirements, Worker Trait Versus Self-Report



Source Class Structure Survey.

Chart 8

Training Requirements, Worker Trait Versus Self-Report



* Per cent High = Requiring Year or More of Training.
Source Class Structure Survey.

2) the job evaluators who originally constructed the worker trait estimates in the late 1960s tended to underestimate skill requirements in goods production (a bias against "blue-collar" work); or

3) skill upgrading has occurred more quickly in the goods sector than in other sectors since the late 1960s.

There is no way to adjudicate among these alternative explanations. What the results suggest, however, is that some caution is warranted in evaluating the effects on the skill distribution resulting from further decline in goods production and growth in services. Estimates based on worker trait data may well overestimate the upgrading and underestimate the deskilling produced by such change.

Gender and Age Differences Within Sectors

As a final comparison, it is instructive to consider whether the worker trait scores are also capable of identifying some of the other differences that we observed with the self-report data. We noted above that on the self-report measures, sex differences in skill levels are especially pronounced in the information sector. Would we come to the same conclusion using worker trait estimates? The answer is yes. As shown in Table C-3 (Appendix C) and illustrated in Chart 9, the worker trait estimates indicate that males in all sectors are in higher-skilled occupations than females and that the gap is least pronounced in the goods sector and most pronounced in the information sector -- precisely the pattern identified with the self-reported skill scores.

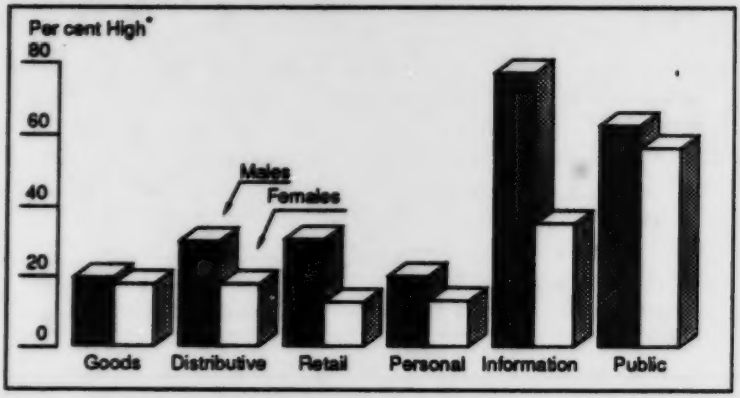
There is a discouraging paradox in these sectoral patterns of skill differences by sex. On the one hand, women make up a majority of employees in the high-skill information and public sectors and these are the only sectors of the economy where women have access to skilled jobs in large numbers. In part, this seems due to the fact that the avenue to skill acquisition in these sectors is through the formal educational system rather than though on-the-job training, which employers seem loath to provide to women. But despite the number of both women and skilled jobs in these sectors and despite the avenues to skill acquisition, sex *differences* in access to skilled jobs is magnified in these sectors, especially in the very highly skilled jobs (see Table C-3, Appendix C). The paradox, then, is that the shift

to high-level information and public services has simultaneously increased the number of "good" jobs available to women *and* intensified the gender structure of the labour market.

As with the previous age-specific comparisons, those presented in Table C-4 (Appendix C) and Chart 10 must be treated with some caution because of sample limitations and low cell frequencies. They indicate that there is a slightly more pronounced but still modest age gradation in skill within industrial sectors in the worker trait scores. Comparison of Chart 10 with Chart 3 also highlights a surprising similarity in some of the within-industry age patterns. Both sets of indicators show an identical inverted U-shaped distribution by age in personal services and public services. With the exception of distributive services, use of either indicator would yield rather similar conclusions concerning age differences in skill level within the six sectors.

Chart 9

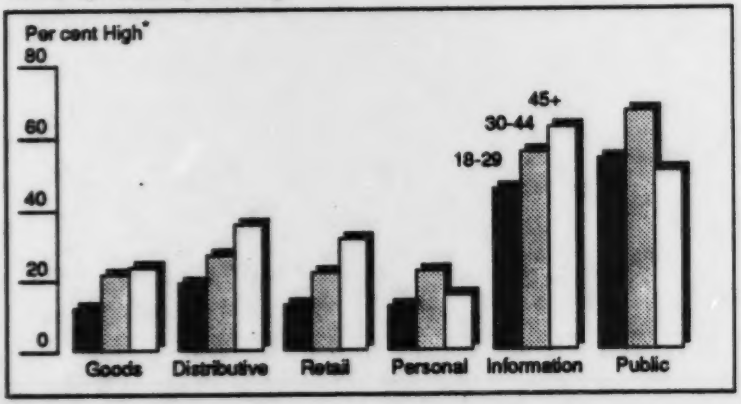
GED by Industry and Sex



* Per cent High: GED Levels 4-6.
Source Class Structure Survey.

Chart 10

GED by Industry and Age



* Per cent High: GED = Levels 4-6.
Source Class Structure Survey.

CONCLUSION

In this report, we have examined industry differences in skill requirements, using two very different measurement strategies -- one relying on respondent evaluations, and the other based on occupation-related assessments prepared by expert raters for the 1971 Census of Canada. In broad detail, both sources draw a similar picture of sector differences in job skills. And both sources identify similar patterns within industrial sectors, such as sex differences in skill requirements. These results are reassuring, since they indicate that past efforts to study skill change with worker trait estimates have not been entirely misleading when measured against the views of those actually in the jobs being evaluated. At the same time, the results indicate that it is possible to study the skill requirements of jobs through survey self-report measures.

But the analysis has also highlighted several differences that call both for caution in the interpretation of results and for further research. A major finding concerns the gender-based organization of the way in which job relevant work skills are acquired. The results indicate that jobs that require extensive on-the-job training and work experience are largely reserved for males. This fact is concealed by the worker trait measure of SVP, since it combines estimates of both on-the-job training and job-relevant training within the educational system. This important sex difference became apparent here only because we were able to separate these two forms of training with the self-report measures. Future research on the gender-based way in which job skills are acquired may shed important light on the creation and maintenance of sex-stereotyped job ghettos.

Secondly, self-reports on skill requirements in 1982 indicate that there is a higher relative skill level in the goods sector than indicated by estimates based on worker trait scores. Since the latter are based on job evaluations made during the 1960s, these differences could be the result of more-rapid decline in unskilled jobs in the goods sector over this period, differences in the measurement procedure, or both. The implication, however, is that if we were to substitute the self-report for worker trait estimates to assess the hypothetical consequences of a shift in employment from goods to services, there would be less "upgrading" than when estimates based on the worker trait measures are used. That is because factory operatives and other workers in the goods sector now claim higher relative skill levels than

were imputed to them in the past. It is probably impossible to determine the true source of this difference; but it is a clear indication that considerable care and more research are required in order to establish the consequences of any future shift to service employment.

APPENDIX A

Rating Level of Specific Vocational Preparation and General Educational Development

Special Vocational Preparation

Level	Time
1	Short demonstration only.
2	Anything beyond short demonstration up to and including 30 days.
3	Over 30 days up to and including 3 months.
4	Over 3 months up to and including 6 months.
5	Over 6 months up to and including 1 year.
6	Over 1 year up to and including 2 years.
7	Over 2 years up to and including 4 years.
8	Over 4 years up to and including 10 years.
9	Over 10 years.

Level	Reasoning development	Mathematical development	Language development
6	Apply principles of logical or scientific thinking to a wide range of intellectual and practical problems. Deal with nonverbal symbolism (formulas, scientific equations, graphs, musical notes, etc.) in its most difficult phases. Deal with a variety of abstract and concrete variables. Apprehend the most abstruse classes of concepts.	Apply knowledge of advanced mathematical and statistical techniques such as differential and integral calculus, factor analysis, and probability determination, or work with a wide variety of theoretical mathematical concepts and make original applications of mathematical procedures, as in empirical and differential equations.	Comprehension and expression of a level to - Report, write or edit articles for such publications as newspapers, magazines, and technical or scientific journals. Prepare and draw up deeds, leases, wills, mortgages, and contracts. - Prepare and deliver lectures on politics, economics, education, or science. - Interview, counsel, or advise such people as students, clients, or patients, in such matters as welfare eligibility, vocational rehabilitation, mental hygiene or marital relations. - Evaluate engineering technical data to design buildings and bridges.
5	Apply principles of logical or scientific thinking to define problems, collect data, establish facts, and draw valid conclusions. Interpret an extensive variety of technical instructions, in books, manuals, and mathematical or diagrammatic form. Deal with several abstract and concrete variables.		

4	Apply principles of rational systems to solve practical problems and deal with a variety of concrete variables in situations where only limited standardization exists. Examples of "principles of rational systems" are: Bookkeeping, internal combustion engines, electric wiring systems, house building, nursing farm management, ship sailing. Interpret a variety of instructions furnished in written, oral, diagrammatic or schedule form.	Perform ordinary arithmetic, algebraic, and geometric procedures in standard, practical applications.	Comprehension and expression of a level to - Transcribe dictation, make appointments for executive and handle his personal mail, interview and screen people wishing to speak to him, and write routine correspondence on own initiative. - Interview job applicants to determine work best suited for their abilities and experience, and contact employers to interest them in services of agency. - Interpret technical manuals as well as drawings and specifications, such as layouts, blueprints and schematics.
3	Apply common sense understanding to carry out instructions furnished in written, oral, or diagrammatic form. Deal with problems involving several concrete variables in or from standardized situations.	Make arithmetic calculations involving fractions, decimals and percentages.	Comprehension and expression of a level to - File, post, and mail such material as forms, cheques, receipts, and bills. - Copy data from one record to another, fill in report forms, and type all work from rough draft or corrected copy. - Interview members of household to obtain such information as age, occupation, and

General Educational Development (Cont'd)

Level	Reasoning development	Mathematical development	Language development
2	Apply common sense understanding to carry out detailed but uninvolved written or oral instructions. Deal with problems involving a few concrete variables in or from standardized situations.	Use arithmetic to add, subtract, multiply, and divide whole numbers.	number of children, to be used as data for surveys, or economic studies. - Guide people on tours through historical or public buildings, describing such features as size, value, and points of interest.
1	Apply common sense understanding to carry out one- or two-step instructions. Deal with standardized situations with occasional or no variables in or from these situations encountered on the job.	Perform simple addition and subtraction, reading and copying of figures, or counting and recording.	Comprehension and expression of a level to - Learn job duties from oral instructions or demonstration. - Write identifying information, such as name and address of customer, weight, number, or type of product, on tags, or slips. - Request orally, or in writing, such supplies as linen, soap, or work materials.

APPENDIX B

Industrial Classification

1 Agriculture

2 Goods
- Fishing
- Forestry
- Mining
- Manufacturing
- Construction

3 Distributive services
- Transportation
- Communication
- Utilities
- Wholesale trade

4 Retail trade

5 People services
- Amusement and recreation
- Personal services
- Accomodation and food services
- Miscellaneous services

6 Information services
- Finance
- Insurance
- Real estate
- Business services

7 Non-market services
- Public administration
- Health and welfare
- Education
- Religious services
- Religious organizations
- Business associations
- Professional membership associations
- Labour organizations
- Political organizations
- Civic and fraternal organizations

APPENDIX C

Supplementary tables

Table C-1

Job Complexity by Industry and Sex, Self-Reports

	Q70 Thought and attention				Q68F Abstract knowledge			
	Low	Medium	High	Total	Low	Medium	High	Total
	(Per cent)							
Goods								
Male	26	36	38	100	31	23	46	100
Female	36	34	30	100	43	26	31	100
Distributive services								
Male	25	28	47	100	29	22	49	100
Female	24	36	40	100	40	14	46	100
Retail								
Male	25	43	32	100	30	19	51	100
Female	34	40	26	100	38	28	34	100
Personal services								
Male	44	28	28	100	45	15	40	100
Female	44	32	24	100	52	17	31	100
Information services								
Male	9	16	75	100	10	14	76	100
Female	17	43	40	100	24	31	45	100

Public services								
Male	13	21	66	100	14	11	75	100
Female	20	29	51	100	19	21	60	100
Total								
Male	22	30	48	100	26	19	55	100
Female	27	34	39	100	32	23	45	100

Source Class Structure Survey.

Table C-2

Job Complexity by Industry and Age, Self-Reports

	Q70 Thought and attention				Q68F Abstract knowledge			
	Low	Medium	High	Total	Low	Medium	High	Total
				(Per cent)				
Goods								
18-29 years	31	36	33	100	38	23	39	100
30-44 years	25	38	37	100	27	26	47	100
45+ years	29	32	39	100	37	21	43	100
Distributive services								
18-29 years	23	28	49	100	35	19	46	100
30-44 years	27	35	38	100	29	19	52	100
45+ years	24	28	48	100	32	20	48	100
Retail								
18-29 years	28	51	21	100	43	26	31	100
30-44 years	25	40	35	100	22	20	58	100
45+ years	39	25	36	100	33	26	41	100
Personal services								
18-29 years	44	31	25	100	51	13	36	100
30-44 years	38	34	28	100	43	21	36	100
45+ years	53	24	23	100	53	18	29	100

Information services								
18-29 years	18	31	51	100	22	24	54	100
30-44 years	8	37	55	100	17	25	58	100
45+ years	15	27	57	100	11	22	67	100
Public services								
18-29 years	15	29	56	100	14	16	70	100
30-44 years	16	22	62	100	13	17	70	100
45+ years	21	28	51	100	27	18	55	100

Source Class Structure Survey.

Table C-3

Distribution of Worker Trait Scores by Industry and Sex

	Level				
	1-2	3	4	5-6	Total
	(Per cent)				
General Educational Development (GED)					
Goods					
Male	44.1	36.3	9.5	10.0	100
Female	39.7	43.0	14.5	2.9	100
Distributive services					
Male	18.6	51.8	20.1	9.5	100
Female	9.6	72.7	11.6	6.0	100
Retail					
Male	33.0	37.0	10.8	19.2	100
Female	29.3	58.2	0.9	11.6	100
Personal services					
Male	53.7	26.5	11.2	8.5	100
Female	49.1	38.0	12.9	0.0	100
Information services					
Male	8.2	14.3	57.4	20.0	100
Female	1.9	63.5	24.1	10.4	100
Public services					
Male	10.8	27.1	30.1	32.1	100
Female	8.0	36.3	41.5	14.3	100

Table C-3 (Cont'd)

	Level					
	1	2	3	4	5	Total
	(Per cent)					
Cognitive Complexity						
Goods						
Male	21.6	23.7	29.5	10.1	15.1	100
Female	28.3	10.4	28.5	18.4	14.4	100
Distributive services						
Male	9.7	29.2	26.0	18.5	16.6	100
Female	4.1	7.0	51.3	26.8	10.8	100
Retail						
Male	17.8	3.9	31.0	25.9	21.4	100
Female	6.3	2.9	50.9	27.4	12.5	100
Personal services						
Male	40.9	9.6	22.2	15.3	12.0	100
Female	47.3	6.0	29.4	11.7	5.5	100
Information services						
Male	0.0	8.2	7.9	34.9	49.4	100
Female	0.5	1.4	41.8	27.2	29.1	100
Public services						
Male	4.5	6.6	13.2	26.2	49.5	100
Female	5.4	9.9	18.1	28.3	38.4	100

Source Class Structure Survey.

Table C-4

Distribution of Worker Trait Scores by Industry and Age

	Level				
	1-2	3	4	5-6	Total
	(Per cent)				
General Educational Development (GED)					
Goods					
18-29 years	44.1	44.0	9.2	2.7	100
30-44 years	41.4	37.1	11.6	9.9	100
45+ years	44.8	32.0	10.6	12.6	100
Distributive services					
18-29 years	16.9	64.2	11.1	7.8	100
30-44 years	16.5	56.9	16.8	9.8	100
45+ years	14.4	50.2	27.5	7.8	100
Retail					
18-29 years	35.5	51.7	3.9	9.0	100
30-44 years	26.0	51.9	4.8	17.3	100
45+ years	29.7	38.8	8.9	22.6	100
Personal services					
18-29 years	55.7	31.9	8.5	3.9	100
30-44 years	42.4	35.1	17.4	5.2	100
45+ years	49.8	35.0	15.2	0.0	100
Information services					
18-29 years	5.6	49.0	34.1	11.3	100
30-44 years	0.9	43.2	40.7	15.2	100
45+ years	8.0	29.6	42.3	20.1	100
Public services					
18-29 years	8.5	37.8	34.0	19.7	100
30-44 years	6.5	26.3	43.9	23.3	100
45+ years	13.3	36.3	29.9	20.5	100

Table C-4 (Cont'd)

	Level					
	1	2	3	4	5	Total
Cognitive Complexity	(Per cent)					
Goods						
18-29 years	23.2	21.2	35.5	9.0	11.1	100
30-44 years	23.7	21.0	26.1	12.3	16.9	100
45+ years	21.8	20.9	27.2	14.0	16.1	100
Distributive services						
18-29 years	8.9	19.0	38.3	23.2	10.5	100
30-44 years	7.5	21.6	36.9	16.7	17.2	100
45+ years	7.9	29.7	21.6	22.9	17.9	100
Retail						
18-29 years	18.3	4.7	41.0	25.6	10.4	100
30-44 years	8.4	3.5	32.5	37.0	18.7	100
45+ years	4.8	1.2	52.9	16.7	24.4	100
Personal services						
18-29 years	45.7	10.9	26.3	10.5	6.6	100
30-44 years	41.1	3.1	28.5	16.9	10.4	100
45+ years	46.9	4.2	24.1	15.4	9.4	100
Information services						
18-29 years	0.0	5.6	29.6	31.4	33.3	100
30-44 years	0.9	0.0	32.0	28.0	39.2	100
45+ years	0.0	8.0	16.6	31.2	44.3	100
Public services						
18-29 years	3.6	10.1	17.4	28.6	40.2	100
30-44 years	3.9	5.4	15.7	26.7	48.4	100
45+ years	8.0	11.5	15.5	27.4	37.6	100

Source Class Structure Survey.

NOTES

1 Occupations were scored by expert evaluators and so have the advantage of being "objective" assessments of the skill requirements of jobs rather than "subjective" reports of job incumbents. The worker trait scores were adopted from the U.S. *Dictionary of Occupational Titles* (or DOT), which have been used for similar purposes in U.S. research (see Spenner, 1983).

2 "Mental complexity" should not be confused with the traditional "mental-manual" distinction that has so confused occupational studies in the past. Skilled carpenters, for example, engage in complex mental work in design and layout, but because they work with their hands they have traditionally been classified as "manual" workers. In contrast, typists, who also work with their hands but often simply transcribe written text, have been classified as "mental" workers. As Poulantzas (1975) pointed out, the mental/manual distinction has served more as an ideological than a technical distinction in the past.

3 The recoded categories on both variables are as follows: low = levels 1 and 2; medium = level 3; high = levels 4 and 5.

4 Supervisors or managers may control others but have little autonomy -- i.e., they regulate others according to well-defined prescriptions and procedures.

5 Inspection of the underlying distributions indicates that the high figure in the public sector is due to the presence of the educational sector. The figure for public administration is 32 per cent; in health and welfare, 24 per cent. The higher autonomy in information sector is entirely due to the presence of business services (36 per cent) in that sector.

6 The results are for the non-agricultural experienced labour force. Changes in the size of industry sectors are based on Picot (1986).

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